

the light path can be altered, thereby changing the spot patterns and consequently the details of the various methods using the electrically converted spot patterns.

What is claimed is:

1. A lens device comprising:  
a lens focussing light into a focal zone and having a  
predetermined effective diameter; and  
light controlling means provided in a light path of said  
lens for preventing light in an intermediate axial region  
of said light path from reaching said focal zone, said  
intermediate axial region being located between near  
axial region which includes a center of said light path  
and a far axial region located radially outward from  
said intermediate region, said light controlling means  
permitting light in said near and far regions of said light  
path to reach said focal zone without imposing a  
relative phase change between light in said near and far  
regions.

2. A lens device according to claim 1, wherein said lens  
is an objective lens.

3. A lens device as claimed in claim 1, wherein said light  
controlling means blocks the light in the intermediate region  
of said light path.

4. A lens device as claimed in claim 1, wherein said light  
controlling means scatters the light in the intermediate  
region of said light path.

5. A lens device as claimed in claim 1, wherein said light  
controlling means diffracts the light in the intermediate  
region of said light path.

6. A lens device as claimed in claim 1, wherein said light  
controlling means absorbs the light in the intermediate  
region of said light path.

7. A lens device as claimed in claim 1, wherein said light  
controlling means reflects the light in the intermediate  
region of said light path.

8. A lens device as claimed in claim 1, wherein said light  
controlling means transmits the light in the intermediate  
region of said light path in a direction irrelevant to said focal  
zone.

9. A lens device as claimed in claim 1, wherein said light  
controlling means refracts the light in the intermediate  
region of said light path in a direction away from said focal  
zone.

10. A lens device as claimed in claim 2, wherein said light  
controlling means controls the light in the intermediate  
region between near and far axes of the incident light beam  
by at least one of blocking, scattering, diffracting, refracting,  
absorbing, transmitting, and reflecting.

11. A lens device as claimed in claim 1, wherein said light  
controlling means has a predetermined region for preventing  
light in an intermediate axial region of said light path from  
reaching said focal zone, said predetermined region having  
an outer diameter smaller than the effective diameter of said  
lens.

12. A lens device as claimed in claim 1, wherein said light  
controlling means is at least one light controlling film of a  
predetermined pattern located on said lens.

13. A lens device as claimed in claim 1, wherein said light  
controlling means includes a transparent member.

14. A lens device as claimed in claim 13, wherein said  
transparent member is spaced apart from said lens by a  
predetermined distance.

15. A lens device as claimed in claim 13, wherein said  
transparent member includes at least one light controlling  
film of a predetermined pattern.

16. A lens device as claimed in claim 1, wherein said light controlling means includes at least one light controlling film of a predetermined pattern located on said lens.
17. A lens device as claimed in claim 1, wherein said light controlling means includes at least one surface irregularity <sup>5</sup> of a predetermined pattern.
18. A lens device as claimed in claim 17, wherein said at least one surface irregularity includes a groove having two converging side walls, the angle at a point of said conversion being less than 90°, wherein one of the side walls has a <sup>10</sup> predetermined slope with respect to an axis of said light path.
19. A lens device as claimed in claim 18, wherein said groove is V-shaped.
20. A lens device as claimed in claim 1, wherein said light <sup>15</sup> controlling means includes at least one surface irregularity of a predetermined pattern, and said at least one surface irregularity includes a groove which has parallel sides and said lens is a planar lens.

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21. A lens device as claimed in claim 17, wherein said at least one surface irregularity includes a protruding wedge-shaped rib.

22. A lens device as claimed in claim 1, wherein said light controlling means includes at least one surface irregularity of a predetermined pattern, and said at least one surface irregularity includes a roughened surface.

23. A lens device as claimed in claim 17, wherein said surface irregularity includes a diffraction lattice for diffracting the light in said intermediate region of said light path away from said focal zone.

24. A lens device according to claim 1, wherein said lens has a refractive surface.

25. A lens device according to claim 1, wherein said lens is a diffractive lens.

26. A lens device according to claim 1, wherein said lens is a planar lens.

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27. A lens for use with optical memory  
disks of at least two types, each type being distinguished  
from another by having information bearing levels at  
different locations along axes of said optical memory  
5 disks, comprising:  
a near axial region which includes a center of a  
light path;  
an intermediate axial region being located  
radially outward from said near axial region; and  
10 a far axial region located radially outward from  
said intermediate region,  
wherein said near region focuses light in said  
light path on the information bearing level regardless of  
which of said at least two types of optical memory disks.
- 15 28. A lens according to claim 27, wherein said  
lens permits light in said far axial region to focus on said  
optical memory disk of one type of optical memory disk,  
but not another.
29. A lens device as claimed in claim 27,  
20 wherein said lens scatters, diffracts, absorbs, reflects or  
diverts light away from said light path.
30. An optical pick-up device for use with  
optical memory disks of at least two types, each type  
being distinguished from another by having information  
bearing levels at different locations along axes of said  
optical memory disks, comprising:  
a light source;  
an objective lens;  
a photodetector which detects light transmitted  
30 through said objective lens and focused on said  
photodetector after being reflected by a disk;  
wherein said lens includes  
a near axial region which includes a center  
of a light path;  
35 an intermediate axial region being located  
radially outward from said near axial region; and

DRAFT DATE: 12/16/2000

a far axial region located radially outward  
from said intermediate region,

wherein said near region focuses light in said  
light path on the information bearing level regardless of  
5 which of said at least two types of optical memory disks.

31. An optical pick-up device according to  
claim 30, wherein said lens focuses light in said far axial  
region on said photodetector for one type of optical  
memory disk, but not another.

10 32. A lens device for use with optical memory  
disks of at least two types, each type being distinguished  
from another by having information bearing levels at  
different locations along axes of said optical memory  
disks, comprising:

15 a lens focusing light into said information  
bearing levels and having a predetermined effective  
diameter; and

20 a light controller provided in a light path of said  
lens which controls light in said light path before reaching  
25 said information bearing levels, said light controller  
includes a near axial region which includes a center of said  
light path, an intermediate axial region being located  
between near axial region and a far axial region located  
radially outward from said intermediate region, said light  
controller permitting light in said near region of said light  
path to focus on the information bearing level regardless  
of which of said at least two types of optical memory  
disks.

30 33. A lens device according to claim 32,  
wherein said light controller permits light in said far axial  
region to focus on said optical memory disk of one type of  
optical memory disk, but not another.

35 34. A lens device as claimed in claim 32,  
wherein said light controller scatters, diffracts, absorbs,  
reflects or diverts light away from said light path.

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35. A lens device as claimed in claim 32,  
wherein said light controller is integral with said lens.

36. A lens device as claimed in claim 32,  
wherein said light controller is separate from said lens.

5           37. An optical pick-up device for use with  
optical memory disks of at least two types, each type  
being distinguished from another by having information  
bearing levels at different locations along axes of the  
optical memory disks, comprising:

10          a light source;  
              an objective lens;  
              a photodetector which detects light transmitted  
through said objective lens and focused said photodetector  
after being reflected by a disk;

15          light controller provided in a light path of said  
lens which controls light in said light path before reaching  
said photodetector, said light controller includes a near  
axial region which includes a center of said light path, an  
intermediate axial region being located between near axial  
20          region and a far axial region located radially outward from  
said intermediate region, said light controller permitting  
light in said near region of said light path to focus on the  
information bearing level regardless of which of said at  
least two types of optical memory disks such that light in  
25          said near axial region reaches said photodetector.

38. An optical pick-up device according to  
claim 37, wherein said light controller permits light in  
said far axial region to focus on said photodetector for one  
type of optical memory disk, but not another.

30          39. An optical pick-up device as claimed in  
claim 37, wherein said light controller is integral with said  
objective lens.

40. An optical pick-up device as claimed in  
claim 37, wherein said light controller is separate from  
said objective lens.

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